Name: *Student id:* *Section:* *Serial#:*

QUESTION #	1	2	3	4	TOTAL
MAX POINTS	8	12	8	12	
POINTS EARNED					

UNIVERSITY OF BAHRAIN
DEPARTMENT OF COMPUTER SCIENCE
CS241: ASSEMBLY LANGUAGE PROGRAMMING

COLLEGE OF INFORMATION TECHNOLOGY
SECOND TEST
TIME: 75 MINUTES
DATE: JAN 02, 2008

QUESTION ONE: **{8 pts}**

Given a predefined array bb consisting of 64 unsigned word values, convert the following C++ code into equivalent assembly code:

```
int ct = 0 , j = 0;
while (j < 64 )
  { if(bb[j] >= 40 && bb[j] < 50)
      ct++; j++;  }
```

```
        .DATA
CTR     DWORD   0

        .CODE
        MOV ESI, 0          ; K → ESI

WHILE:  CMP ESI, 63 * 2
        JG  ENDW

        CMP BB[ESI], 40
        JB  NEXT

        CMP BB[ESI], 50
        JAE NEXT

        INC CTR

NEXT:   ADD ESI, 2
        JMP WHILE
ENDW:
```

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QUESTION TWO: Write a sequence of assembly instructions to perform each of the following tasks:

1) Give ONE instruction to set bits 5 to 11 in BX register. Leave other bits in BX unchanged **{2 pts}**

```
OR      BX, 0FE0H
```

2) Give No more than 2 instructions to divide **EAX / EDI**. **{2 pt}**

```
CDQ
IDIV    EDI
```

3) Give No more than 2 instructions to SET all bits in **eflags** register. **{2 pt}**

```
PUSH    0FFFFFFFFH
POPFd
```

4) Give No more than 2 instructions to shift right the entire value in **CX:DX** ONE bit . **{2 pt}**

```
SHR     CX, 1
RCR     DX, 1
```

5) Give No more than 2 instructions to store in ESI register the quotient of dividing BL register by 16. BL register may contain any unsigned value. **{2 pts}**

```
MOVZX   ESI, BL
SHR     ESI, 4
```

6) Give No more than 2 instructions to display the value of the last 2 words saved on the stack. **{2 pts}**

```
POP     EAX
CALL    WRITEINT
```

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QUESTION THREE: **{8 pts}**

a)
```
MOV  BX, 49F3H
ROL  BX, 4
XOR  BX, 0E07FH
```

BX = 7F4B H

b)
```
MOV  AX, 70F2 H
MOV  BX, 459CH
TEST BX, AX
```

BX = 459C H

c)
```
MOV  BX, 6C4FH
NOT  BX
AND  BX, 4AC6H
```

BX = 0280 H

d)
```
MOV  BX, 4F7AH
MOV  CX, 2F04H
SHL  BX, CL
```

BX = F7A0 H

e) What will be in registers BX and SP after executing the following instruction sequence?

```
        MOV     SP, 2FD0H
        MOV     CX, 4AF7H
        MOV     BX, 9F4CH
        PUSH    SP
        PUSH    CX
        CMP     CX, -2
        JL      L2
        POP     BX
        ROR     BX,8
L2:     XOR     BX, CX
```

SP = 2F CE H

BX = BD BD H

f) If "JL L2" is replaced by "JB L2", what will be in registers BX, SP after executing the above code?

SP = 2F CC H

BX = D5 BB H

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QUESTION FOUR: **{12 pts}**

Write a complete assembly program that uses the procedure `SMALLER` to find out and print (in proper format) the `SMALLEST` element of an array hh consisting of 64 signed words. Write the procedure `SMALLER` such that it receives 2 memory words: a and b and returns in a word `res` the smaller of a and b as a result.

```
        INCLUDE IRVINE32.INC

        .DATA
MYARR   SWORD   -10,+30,-322,-80,+99,-4,+60,+98,-34,+177,-90,+55
M2      BYTE    " THE SMALLEST ARRAY ELEMENT IS: ",0
small   sword   ?

        .CODE
;   ************************************
Smaller proc    a: sword, b: sword, res: ptr sword
        MOV     aX, a
        MOV     bx, b
        mov     edi, res
        mov     word ptr [edi], ax
        CMP     aX,bx
        JLE     DONE
        mov     word ptr [edi], bx
DONE:   ret
smaller endp

BEGIN   PROC

;   FINDING SMALLEST ELEMENT ****************
        MOV     ECX, LENGTHOF MYARR - 1
        MOV     ESI, 0

        MOV     dx,MYARR[ESI]
        mov     small, dx
L8:     invoke  smaller, small, MYARR[ESI+2], addr small
        ADD     ESI,2
        LOOP    L8
;   DISPLAY SMALLEST ELEMENT  *****************
        LEA     EDX, M2
        CALL    WRITESTRING

L2:     MOVSX   EAX, small
        CALL    WRITEINT
        CALL    CRLF
        EXIT
BEGIN   ENDP
        END     BEGIN

;  THE SMALLEST ARRAY ELEMENT IS: -322
```